



**SM-3500**

## **Wideband Spectrum Monitoring System**

### **Technology Overview**

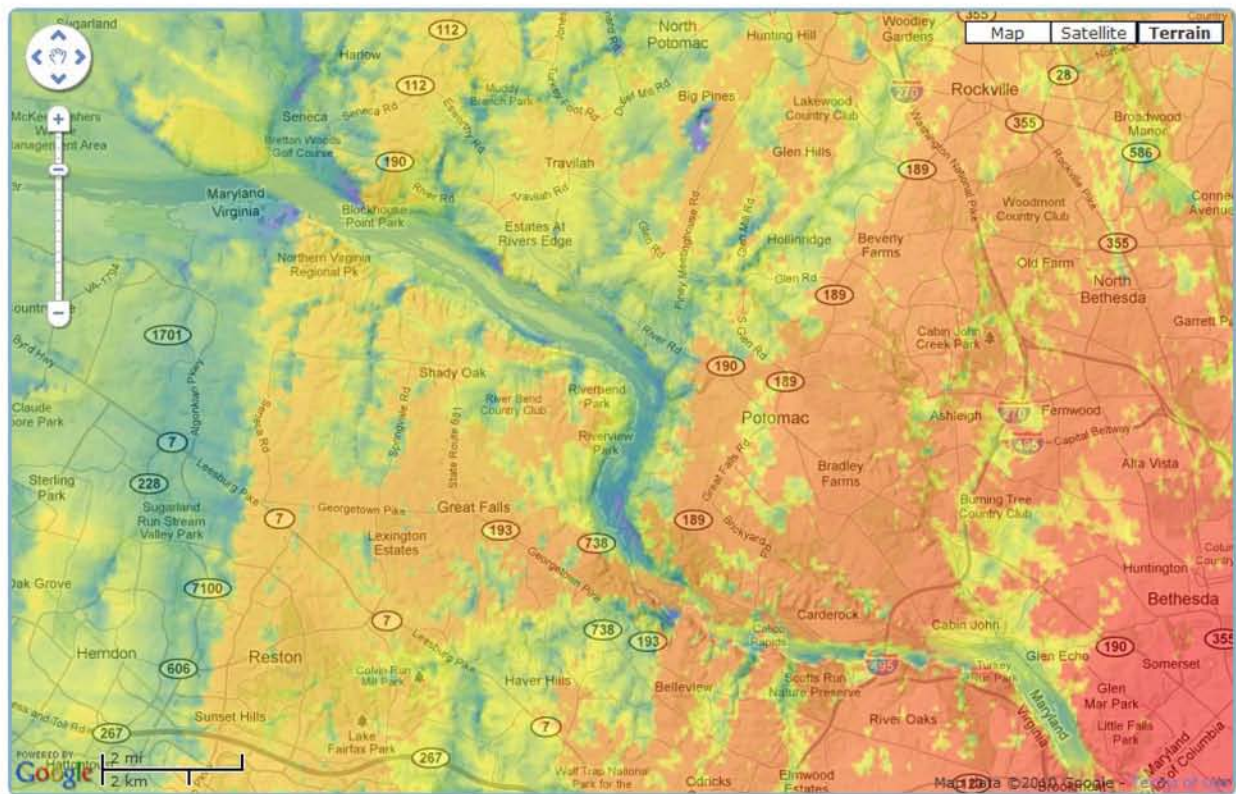
The Key Bridge SM-3500 Wideband Spectrum Monitoring system provides a powerful and cost-effective turn-key solution to gain detailed spectral awareness across large geographic areas and over extended periods.

Our fully integrated software suite helps to transform the mountains of data received from a RF sensor network into meaningful, actionable information in near real-time. The software includes Network Messenger, Spectrum Archive, Data Analysis, Sensor Control and Graphical User Interface components.

The SM-3500 Wideband Spectrum Monitoring system supports a variable sized constellation of intelligent spectrum sensors for data collection that may be permanently or intermittently connected to the Network. Sensors may be remotely deployed and connected over any standard TCP/IP network to provide high performance remote signal monitoring and near real-time carrier detection – within a building, city-wide, or across an entire theater of operation.

The Key Bridge SM-3500 Wideband Spectrum Monitoring system is built around a custom developed, network-aware, digital RF sensing device with frequency coverage of 5 MHz to 2,500 MHz for rapid identification of fixed and transient signals in most all commercially and tactically relevant parts of the spectrum. The system seamlessly merges the capabilities of high-performance spectrum analysis with a geographically distributed intelligent sensor network.





Detection of transmitter locations and power measurement enable accurate prediction of area field strength coverage

## Key Features

- End-to-end spectrum monitoring system supports a variable sized constellation of sensors
- Intelligent, network aware digital receiver with 5 MHz to 2,500 MHz frequency response
- Fine grained job control for operation across large geographies and frequencies of interest
- Simplified field installation and configuration: Connect the antenna + power and GO!
- Large internal storage enables off-network monitoring with no impact on performance
- Calibrated digital measurements with time-stamping
- Optional GPS support for field monitoring and “drive test” surveys
- Industry standard TCP/IP networking, security and data encryption enabled by default
- Enclosure options support indoor and outdoor installations
- Solid state drive and internal battery options available

## Primary Applications

- Spectrum occupancy, utilization and monitoring and inventory
- Signal search, detection and carrier identification
- Interference and carrier intrusion detection and resolution
- Continuous spectrum and carrier performance monitoring
- Long-term spectrum characterization and noise floor measurements
- Emitter GEO-location



## Multiple Wideband RF Sensors

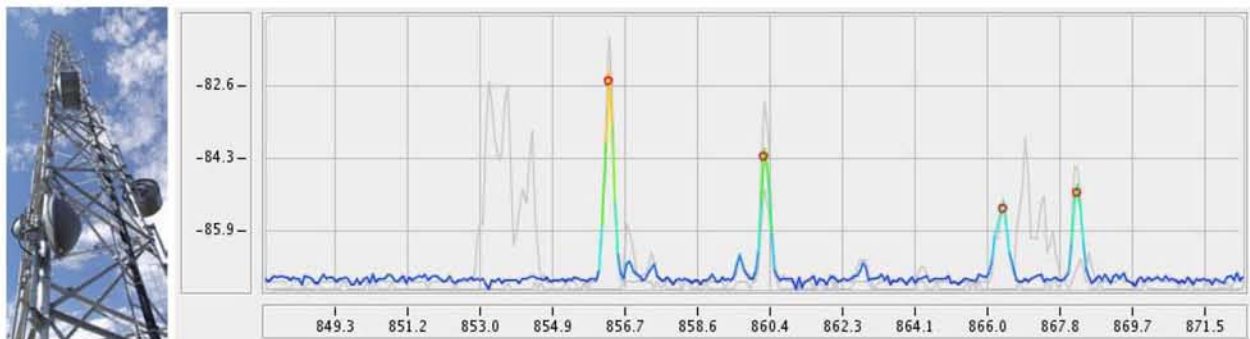
Modern wireless transmitters may operate with lower power, higher frequencies and wider signal bandwidths than before. New cognitive and software defined radios can be frequency agile, finding and transmitting in channels across a wide spectrum, while RF propagation characteristics may create hidden nodes that are not detectable at a receiver's location.

These trends require a new approach to spectrum monitoring, carrier detection and transmitter identification where receivers must be both located closer to the transmitter and distributed across geographic areas of interest. The Key Bridge SM-3500 Wideband Spectrum Monitoring system provides an affordable turn-key solution for these unique challenges.

## Fixed and Mobile Multi-Sensor Networks

Captured spectrum data is automatically geo-tagged whenever the optional GPS receiver is attached to the RF sensor. Combined with the device's internal storage and persistent configuration, the SM-3500 supports mobile sensing and on-the-move survey applications out-of-the-box and with no additional configuration required.

If desired, a local computer can directly interface with the device to view spectrum survey data and receive alerts in near real-time. Data is recorded and automatically synchronized with the System Manager when network connectivity is reestablished.



Screen capture of Active Carrier Detection (red dots)  
Also showing max/min envelope (grey)

## Automated Carrier Detection and Identification

Continuous and transient candidate signals are automatically identified and flagged in near real-time. When connected to the network, the system attempts to match detected signals with known entities in its ITU allocation and US licensed transmitter database. For operations outside the United States, spectrum plan information can be entered in a number of ways: automatically via external data services, by bulk data import into the system's database, semi automatically via user acknowledgement of detected signals, or via user data entry.

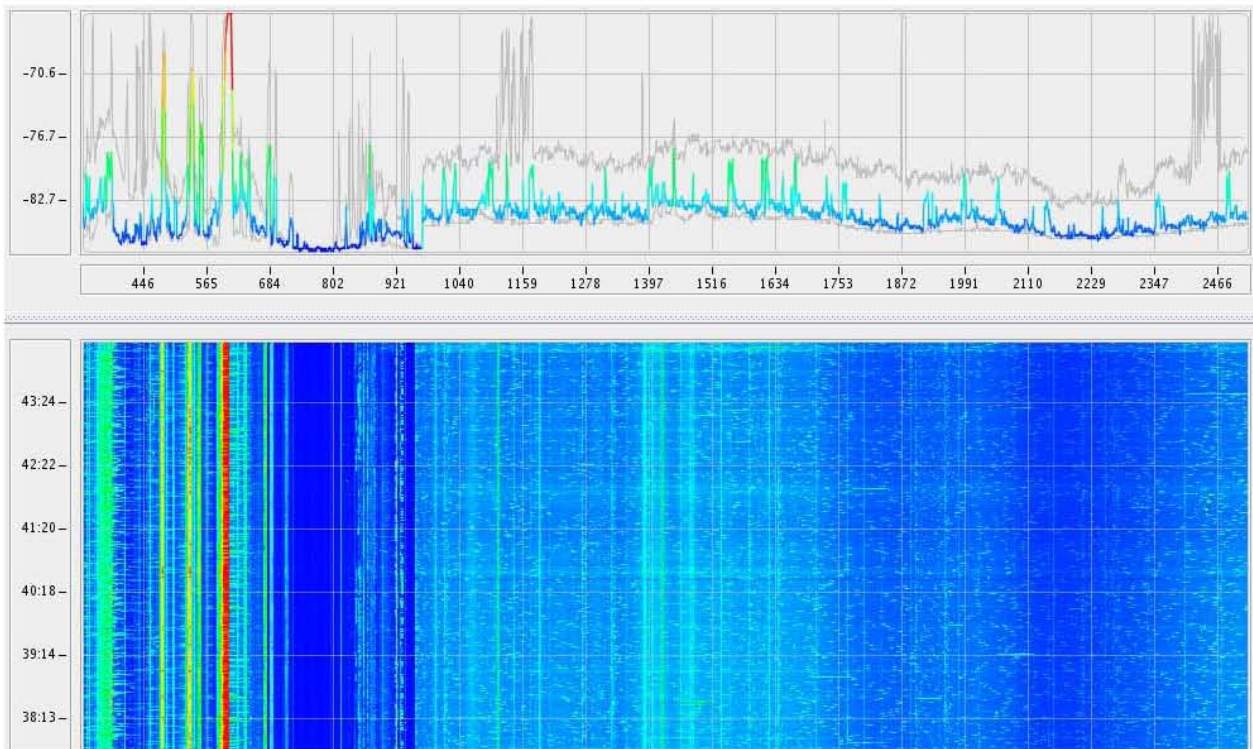
## Distributed Intelligence with Central Analysis and Control

Key Bridge custom developed RF sensors are intelligent network appliances with local spectrum processing and analysis capability. Our spectrum monitoring and carrier detection system places low-cost, high performance general processing power close the data acquisition source. Rapid deployment and system expansion into new geographic areas of interest is possible without an immediate corresponding requirement for command and control infrastructure. A sensing system can be deployed immediately and then synchronized days, weeks or months later with no loss of data while infrastructure catches up.

## Continuous, Long-Term Monitoring

Accurate spectrum monitoring requires continuous data acquisition over extended periods. Whether ensuring the presence of known carriers, assuring the absence of unwelcome transmitters or monitoring transient or unlicensed activities, only continuous, long-term monitoring can provide meaningful context and perspective.

The obvious benefits of sustained monitoring are often not realized because most spectrum analyzers are prohibitively expensive, not network aware, and cannot be remotely installed or controlled. Key Bridge solves this problem with a custom-developed low-cost, network-enabled intelligent receiver that leverages local processing and storage with central management, analysis and control.



Screen capture of Wideband Survey  
Also showing spectrum envelope (max/min received power in grey)

## Technical Specifications and Operating Characteristics

### SM-3500 Compute Servers

The system's modular design creates an affordable entry point with accommodation to add high-availability, load balancing and fail-over redundancy as the system grows.

A minimum production configuration is comprised of four physical servers.

#### Operating System

**Security Enhanced Linux**  
(Solaris OS optional )

**n x Storage Archive Server**  
(1 or more required)

#### Industry standard 4U rack mount server

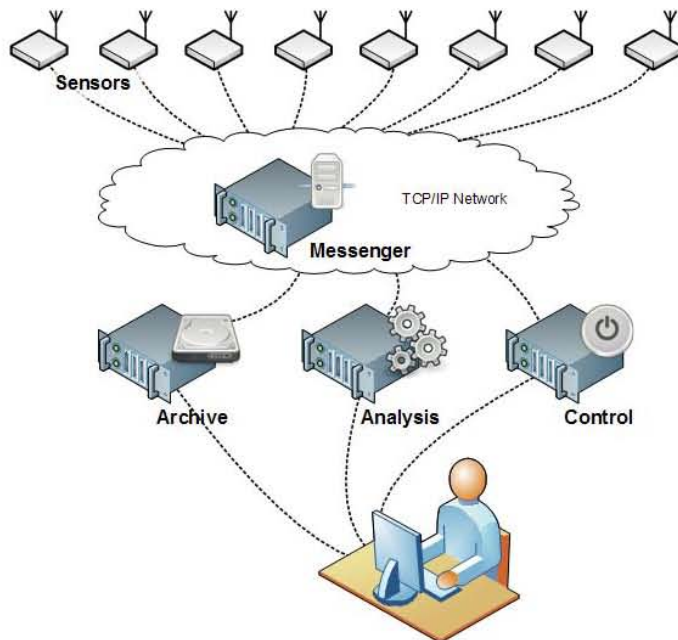
2 x Intel Xeon E5620 2.4 GHz  
2 x 1000 BaseT Ethernet LAN  
6 GByte RAM  
24 TByte RAID 6 storage

**1 x Analysis Server**  
**1 x Control Server**  
**2 x Messaging Servers**

#### Industry standard 1U rack mount server

2 x Intel Xeon E5620 2.4 GHz  
2 x 1000 BaseT Ethernet LAN  
6 GByte RAM  
1 TByte storage

(minimum 3 required. Analysis & Control software may run on the same server)



Spectrum data encrypted at the source

Employ transport-layer security with mutual authentication for all network transactions

Independent servers may be logically and geographically distributed

High-availability configurations available

Fine-grained configuration enables role-based access to data, analysis and management resources

Simple system schematic showing the five core system components:  
Sensor Constellation, Messenger, Archive, Analysis & Control

## Technical Specifications and Operating Characteristics

### NSS-2500L Intelligent Spectrum Sensor

The detector is designed to simplify a technician's task load while ensuring reliable, high-performance data acquisition. It has no front panel controls and is fully capable of independent, un-tethered operation.

Frequency Coverage	5 MHz to 2,500 MHz
Span Width	1 MHz to 1,250 MHz
Resolution Bandwidth	0.01 MHz to 1 MHz
RF Sensitivity	Greater than -85 dBm typical
Reference Levels	-10 dBm to -50 dBm
Dynamic Range	40 dB
Receiver Accuracy	+/- 1 dB typical
Frequency Accuracy	+/- 0.001 MHz typical
Input Connector	BNC (Others optional)
CPU	Intel Atom Z530 1.6 GHz
Memory	1 GByte DDR2
Storage	320 GB HDD (40 GB Solid State Drive optional)
Networking	2 x 1000 BaseT Ethernet (optional with 802.11g WLAN)
Operating System	Security Enhanced Linux, Embedded
Size	12" x 8" x 2" for indoor unit 11" x 9" x 5" for outdoor unit
Weight	4 lbs for indoor unit 5 lbs for outdoor unit (w/o battery)
Power Requirements	+12 VDC / 25 W maximum draw
Operating Temperature	0 – 40 deg C



NSS-2500L Indoor Unit Configuration



Outdoor Unit Enclosure

## System Ordering Information

A minimum production configuration includes the full software suite, four servers and five sensors. The basic software license supports up to 25 ea. NSS-2500L sensors, which may be added as necessary. Additional sensor software licenses may be added in increments of 25.

Sensor units may be ordered in any quantity.

Qty	Product ID	Description
1 ea.	SM-3500	Wideband Spectrum Monitoring System. Includes:
	DB-25	1 ea. Spectrum Storage Archive Server (25 sensor license)
	MQ-25	2 ea. Network Message Server (25 sensor license)
	AA-25	1 ea. Analysis and Action Server (25 sensor license)
	CC-25	1 ea. Command and Control Server (25 sensor license)
5 ea.	NSS-2500L	Intelligent Network Spectrum Sensor



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- **Radio Spectrum Monitoring**

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